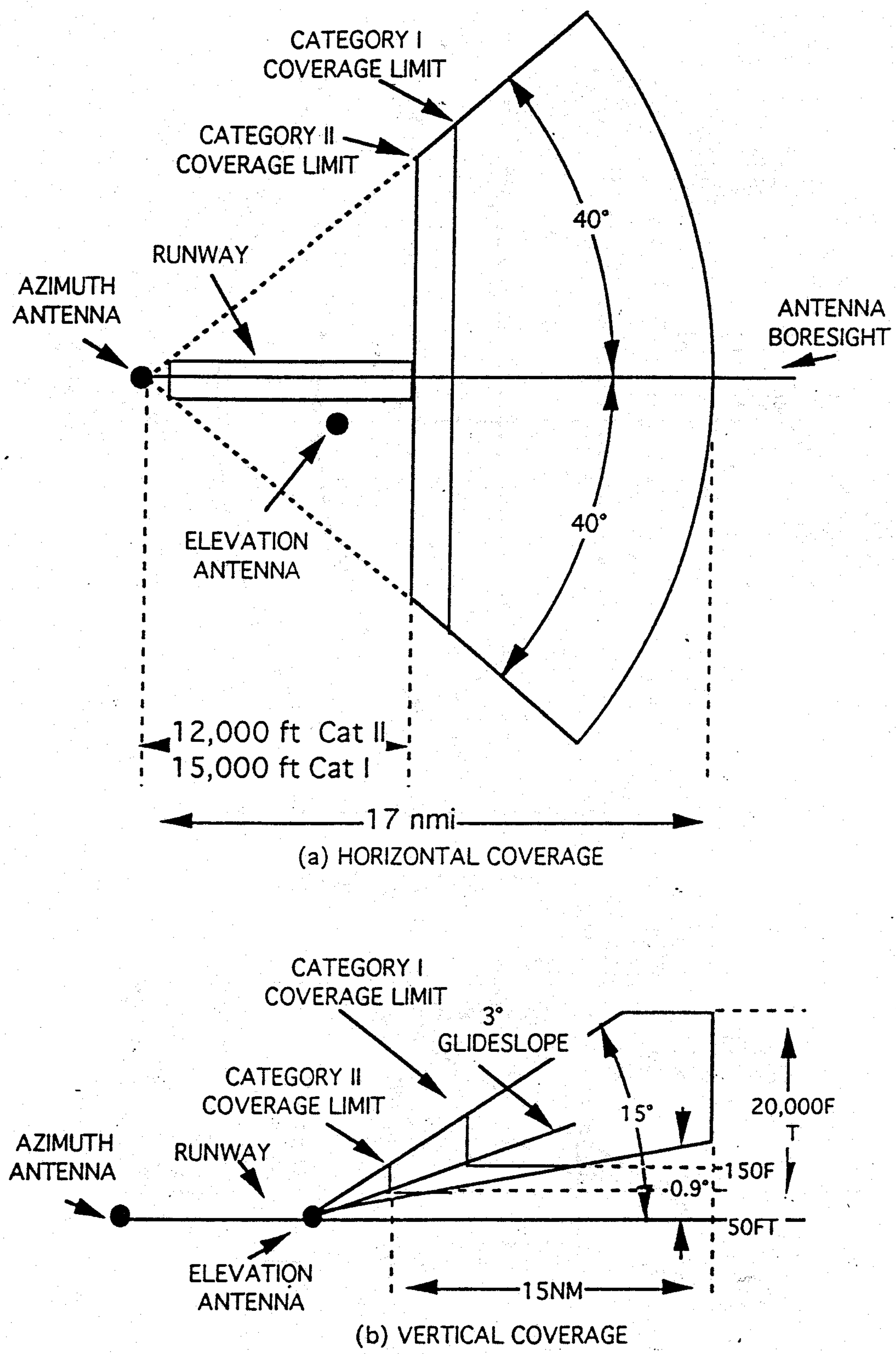

Figure 3. Split Site Azimuth Equipment Coverage

3.1.4.1.14.2 Scanning Beam Shape. The minus 10 dB points on the beam envelope shall be displaced from the beam center by at least 0.76 beamwidth, but not more than 0.96 beamwidth.

3.1.4.1.14.3 Dynamic Sidelobes. The dynamic sidelobes shall not exceed the values necessary to satisfy the accuracy specifications in 3.1.4.1.9.2. Furthermore, the dynamic sidelobes or any spurious signal generated by the elevation equipment shall be at least 10 dB below the main lobe level. This requirement shall apply throughout the proportional guidance sector.

3.1.4.2 Ranging Functions.

3.1.4.2.1 DME/P System Characteristics.

3.1.4.2.1.1 DME/P Coverage. The DME/P shall provide a cylindrical region of coverage extending 17 nmi from the DME/P antenna. This basic coverage volume shall be further limited as follows:

a. Coverage is only required between horizontal planes 50 ft and 20,000 ft above the runway threshold.

b. Coverage is only required between the following two conical surfaces. Each defining cone has its vertex at the DME/P antenna with its axis lying along the vertical. The cone defining the lower surface of coverage is inclined at 0.9° relative to the horizontal. The cone defining the upper surface limit is inclined at an angle of 15°.

c. Coverage at the reference datum shall be provided under all conditions.

3.1.4.2.1.2 Channeling. The DME/P shall operate on any of the 200 channels paired to an MLS channel as specified in table A of ICAO SARPS Annex 10. Any channel shall be selectable without alignment, replacement, or rewiring of components.

3.1.4.2.1.3 Capacity. The processing capacity of the transponder shall be sufficient for handling 100 interrogators, 50 of which may be operating in the final approach (FA) mode.

3.1.4.2.1.4 DME/P Transponder Identification. The DME/P shall transmit an identification signal as specified for transponders associated with MLS facilities in 3.5.3.6 including subparagraphs of ICAO SARPS Annex 10.

3.1.4.2.1.5 DME/P Modes. The DME/P shall have two operating modes, initial approach (IA) and FA. Mode transition shall be as specified in 3.5.3.7 of ICAO SARPS Annex 10.

3.1.4.2.2 DME/P Transmitter.

3.1.4.2.2.1 Frequency of Operation. The transponder shall transmit on the reply frequency of the operating channel assigned in 3.1.4.2.1.2.

3.1.4.2.2.2 Frequency Stability. Transmitter frequency stability shall be as specified in 3.5.4.1.2 of ICAO SARPS Annex 10.

3.1.4.2.2.3 Pulse Shape and Spectrum. The pulse shape and spectrum shall be as specified for DME/P accuracy standard 1 radiated pulses in 3.5.4.1.3 of ICAO SARPS Annex 10.

3.1.4.2.2.4 Pulse Spacing. Pulse spacing for DME/P shall be as specified in table A and 3.5.4.1.4, including subparagraphs, of ICAO SARPS Annex 10.

3.1.4.2.2.5 Power Density. The peak power output shall be as specified for DME/P in 3.5.4.1.5, including subparagraphs, of ICAO SARPS Annex 10 excluding the power density requirement at 8 ft above the runway surface.

3.1.4.2.2.6 Spurious Radiation. Spurious radiation requirements shall be as specified for DME/P in 3.5.4.1.6, including subparagraphs, of ICAO SARPS Annex 10.

3.1.4.2.2.7 Squitter. Squitter pulse pairs shall be automatically generated and controlled to maintain a minimum DME/P output transmission rate that is not less than 700 pulse pairs per second. In no case shall this minimum output transmission rate exceed 1,200 pulse pairs per second. No squitter shall be added when the output transmission rate is greater than the minimum rate. DME/P receiver internal noise shall not be used as the source for squitter pulses. Distribution of squitter pulse pairs shall be nonuniform, with no pulse pairs spaced less than 200 microseconds (μs) apart or within the range of 730 to 750 μs. Squitter pulses shall not be generated while equipment is in STANDBY or in the STANDBY portion of the SERVICE-DEMAND mode.

3.1.4.2.2.8 Priority of Transmission. Transmission of DME/P output signals shall have the following order of precedence:

a. Distance reply pulse pairs in the FA mode

b. Identification pulse pairs

c. Distance reply pulse pairs in the IA mode

d. Squitter pulse pairs

Transmission priority, employing priority intervals, shall be established on the basis of the first pulse of a pulse pair. Two priority intervals, neither of which shall exceed 12 μs, shall exist before and after the virtual origin of the first pulse. If this virtual origin falls within another pulse's priority intervals, the order of priority, as listed above, shall govern which pulse pair is to be transmitted. Should the virtual origin fall outside of the priority intervals, then priority becomes void and transmission shall be effected for the virtual origin occurring first, provided its transmission is consistent with other specification constraints. The identification pulse pairs shall be inhibited, except during the Morse code key-down periods. During these key-down periods, no pulse pairs of lesser precedence shall be transmitted. The IA mode distance reply pulse pairs shall not be inhibited during the time intervals between the Morse code key-down periods, unless they would coincide with an FA mode priority interval. Squitter pulse pairs shall be inhibited when the spacing between the squitter pulse pair and a reply pulse pair is such that the first pulse of the reply would be distorted.

3.1.4.2.3 DME/P Receiver.

3.1.4.2.3.1 Frequency of Operation. The receiver center frequency shall be the interrogation frequency of the DME operating channel assigned in 3.1.4.2.1.2.

3.1.4.2.3.2 Frequency Stability. Receiver frequency stability shall be as specified in 3.5.4.2.2 of ICAO SARPS Annex 10.

3.1.4.2.3.3 Sensitivity. Receiver sensitivity shall be as specified in 3.5.4.2.3, including subparagraphs, of ICAO SARPS Annex 10.

3.1.4.2.3.4 Sensitivity Reduction. Sensitivity reduction shall be as specified for DME/P in 3.5.4.2.4, including subparagraphs, of ICAO SARPS Annex 10.

3.1.4.2.3.5 Bandwidth. Receiver bandwidth shall be as specified for DME/P in both the IA and FA modes in 3.5.4.2.6, including subparagraphs, of ICAO SARPS Annex 10.

3.1.4.2.3.6 Recovery Time. Receiver recovery time shall be as specified in 3.5.4.2.7 of ICAO SARPS Annex 10.

3.1.4.2.3.7 Spurious Radiation. Spurious radiation requirements shall be as specified in 3.5.4.2.8 of ICAO SARPS Annex 10.

3.1.4.2.3.8 Echo Suppression. An echo suppression feature shall be provided for the IA operating mode that in no way affects the operation of the FA mode. The echo suppression feature shall be enabled for a selectable time interval when a valid IA mode interrogation pulse pair is received that has pulse amplitudes in excess of a preset level. During the echo suppression time interval, only IA mode pulse pairs with pulse amplitudes greater than the enabling pulse pair shall be recognized as valid IA mode interrogations. The preset enabling level shall be selectable from 10 dB above IA mode threshold sensitivity to greater than the maximum interrogation signal levels specified. The signal level required for IA mode pulse pairs to be recognized as valid during the echo suppression interval shall be selectable in the range from 0 to 6 dB above the enabling level. The echo suppression time interval shall be selectable over the range of 30 to 150 μsec. The signal level and echo suppression time interval values shall have a default capability, initially set at the factory to 3 dB and 50 μsec, respectively. Adjustment of the signal level and echo suppression time intervals shall be provided by a protected control.

3.1.4.2.3.9 CW Interference. Presence of a CW interference on the assigned channel frequency, or elsewhere within the receiver passband that has a peak power of -100 dBm at the antenna, shall not cause the reply efficiency of FA mode or IA mode interrogations from a single interrogator at their respective threshold sensitivity level to change by more than 10 percent from the reply efficiency value obtained without the CW interference. The signal level of the interrogations shall be:

a. FA Mode - Minimum sensitivity value

b. IA Mode - FA value plus 4 dB

3.1.4.2.4 Decoding. Decoding requirements shall be as specified for DME/P in 3.5.4.3, including subparagraphs, of ICAO SARPS Annex 10.

3.1.4.2.5 Time Delay. Time delay requirements shall be as specified for DME/P associated with MLS in both the IA and FA modes in 3.5.4.4, including subparagraphs, of ICAO SARPS Annex 10.

3.1.4.2.6 Accuracy. The DME/P transponder accuracy shall be as specified for DME/P accuracy standard 1 in both the IA and FA modes in 3.5.4.5, including subparagraphs, of ICAO SARPS Annex 10.

3.1.4.2.7 <u>Efficiency</u>. The DME/P transponder reply efficiency shall be as specified for DME/N and DME/P in both the IA and FA modes in 3.5.4.6, including subparagraphs, of ICAO SARPS Annex 10 under the loading specified in 3.1.4.2.1.3.

3.1.4.3 <u>Monitor Functions</u>. The MMLS shall provide a signal monitor function to ensure the integrity of the transmitted angle guidance, data, and the DME/P signals. The monitor shall include internal, integral, and field sensors. The design shall emphasize the use of internal and integral sensors rather than field sensors. Signals from the sensors shall be processed to provide a real time continuous assessment of system performance. A transmitted signal that is out of tolerance or failure of any part of the monitor function shall directly result in an alarm condition. For such parts as electronical or electromagnetic switching devices, where it is not practical to provide fail-safe operation under both failure modes (open circuit or short circuit), fail-safe protection shall be provided for the failure mode that is more likely to occur.

3.1.4.3.1 <u>Integrity Requirement</u>. The integrity of each azimuth, elevation, and DME/P equipment shall meet or exceed the level 2 integrity value specified in table C-2 of ICAO SARPS Annex 10. To ensure integrity, the transmitter and monitor shall be independent.

3.1.4.3.1.1 <u>End-to-End Integrity Check Capability</u>. Each azimuth equipment, elevation equipment, and DME/P equipment shall be capable of performing end-to-end integrity checks. The proper operation of each active monitor channel, any monitor voting logic, and the control circuits shall be verified by this check. It shall be possible to initiate these checks via the local control while in the MAINTENANCE mode. Failure of these checks shall cause a monitor alarm to occur.

3.1.4.3.2 <u>Angle and Data Monitoring</u>.

3.1.4.3.2.1 <u>Angle and Data Monitor Parameters</u>. MMLS shall be capable of monitoring at a minimum, the parameters specified below. The time periods specified shall include the monitor measurement period, monitor reaction times and delays in control functions.

a. A shift in the mean course of ±35 ft over a time interval of 10 seconds for Category I operations and of ±25 ft over a time interval of 5 seconds for Category II operations;

b. A shift in the mean glidepath of ±.225° over a time interval of 6 seconds for Category I operations and of ±.225° over a time interval of 2 seconds for Category II operations;

c. Reductions in the radiated power to less than that necessary to satisfy the requirements specified in 3.1.4.1.10 for a period of more than 6 seconds for Category I operations and 2 seconds for Category II operations;

d. Errors in preamble or data transmissions which persist for more than of 6 seconds for Category I operations and 2 seconds for Category II operations;

e. The timing standards specified in 3.1.4.1.3.2 are exceeded for a period of more than 6 seconds for Category I operations and 2 seconds for Category II operations; and

f. Errors in the TDM synchronization specified in 3.1.4.1.3.4 for more than 6 seconds for Category I operations and 2 seconds for Category II operations.

3.1.4.3.2.2 Angle and Data Monitor Characteristics. The monitor shall satisfy the following requirements:

a. The limits of each monitored parameter shall be adjustable over a range from +100 percent to -50 percent of the specified values, in increments of 10 percent. Adjusted parameter values shall take precedence over any preset or calculated values. This adjustment capability shall be provided by a protected control at the local control unit.

b. Monitors shall be capable of supporting the response times given in 3.1.4.3.2.1 when switched to the ON mode or angle guidance radiation is activated in the SERVICE-DEMAND mode.

c. Shifts in the mean angle error shall be measured by both a field sensor and an integral sensor. However, it shall be possible to inhibit the output from the field sensor as specified in 3.1.4.3.2.3.c.

d. An error in the data transmissions shall be indicated and localized to one of the following messages:

   1. Function preamble
   2. Morse code identification
   3. Basic data word
   4. Auxiliary data word

e. Where two or more sensors are used to monitor a single parameter, a majority of sensors shall agree that the parameter is in tolerance in order to permit radiation to continue.

f. In the MAINTENANCE mode the monitor shall be inhibited from interrupting radiation except while performing end-to-end integrity checks.

g. In MAINTENANCE mode, controls shall be provided to shift mean angles to the extent required to cause an alarm. The mean angle values shall be restored to their previously established values by manual entry or automatically upon leaving the MAINTENANCE mode.

3.1.4.3.2.3 Responses to Angle and Data Monitor Alarms. Angle and data monitor alarms shall cause radiation to cease in accordance with 6.1, excluding references to back azimuth and flare elevation functions of Attachment G to Part I of ICAO SARPS Annex 10 and shall automatically initiate the following actions:

a. Provide an automatic restart after 20 seconds. A means shall be provided at the local control to permit the selection of the monitor limits to be used in the restart attempt. It shall be possible to attempt restart without a change in monitor limits. When the equipment is operating under Category II monitor limits, it shall be possible to attempt the restart with the monitor limits automatically changed to those for Category I.

b. Provide visual alarm indications to the local and remote displays and aural alarms at the remote display. A control shall be provided to reset the aural alarm.

c. The ground equipment shall be capable of operation with the field sensor disabled for Category I service only. When the field sensor is disabled, an indication shall be provided on the local and remote displays.

3.1.4.3.3 DME/P Monitoring. The DME/P monitor shall cause the transponder radiation to cease and provide a warning at a control point if any of the following conditions persists for longer than the period specified:

a. there is a change in transponder PFE that exceeds the limits specified in either 3.5.4.5.3.1 or 3.5.4.5.4 of ICAO SARPS Annex 10 for more than 2 seconds. If the FA mode limit is exceeded, but the IA mode limit is maintained, the IA mode may remain operative;

b. there is a reduction in the effective radiated power to less than that necessary to satisfy the requirements specified in 3.1.4.2.2 of ICAO SARPS Annex 10 for a period of more than 1 second;

c. there is a reduction of 5 dB or more in the transponder sensitivity necessary to satisfy the requirements specified in 3.5.4.2.3 of ICAO SARPS Annex 10 for a period of more than 5 seconds (provided that this is not due to the action of the receiver automatic sensitivity reduction circuits);

d. the spacing between the first and second pulse of the transponder reply pulse pair differs from the value specified in the table in 3.5.4.4.1 of ICAO SARPS Annex 10 by 1.0 microsecond or more for a period of more than 1 second.

3.1.4.3.3.1 Monitor Logic and Adjustability. It shall not be possible for the monitor to turn on the MMLS equipment while in the SERVICE-DEMAND mode. In addition, the monitor shall be as specified in subparagraphs 3.5.4.7.3.2, 3.5.4.7.3.3, and 3.5.4.7.3.4 of ICAO SARPS Annex 10 except as modified in 3.1.4.3.3 and shall satisfy the following requirements:

a. Where two or more sensors are used to monitor a single parameter, a majority of the sensors must agree that the parameter is in tolerance in order to permit radiation to continue.

b. The limits of each monitored parameter shall be adjustable over a range between ±50 percent of the nominal value, in 10 percent increments. This adjustment capability shall be provided by a protected control at the local control unit.

3.1.4.3.3.2 Responses to DME/P Monitor Alarms. DME/P monitor alarms shall cause an MMLS response as specified in 6.1, including subparagraphs of Attachment G to Part I of ICAO SARPS Annex 10 and shall automatically initiate visual indications to the local and remote displays and aural alarms at the remote display. A front panel control shall be provided to reset the monitor alarms.

3.1.4.4 Control and Display Functions. The MMLS shall include local and remote control and display functions to permit setup, unattended operation, monitoring, and maintenance. Control of the MMLS shall be restricted to authorized personnel.

3.1.4.4.1 Local Control. Local controls shall provide for channel selection, data entry, alignment, selection of landing performance categories, field sensor bypass, and selection of equipment operating modes. For the split-site configuration, a local control and display unit shall be provided with the approach azimuth equipment and another with the approach elevation equipment. The azimuth local control unit shall provide the controls for

DME/P, including indications of DME/P forward and reflected power levels. When set up in the collocated configuration, a single local control unit shall be capable of controlling the azimuth, DME/P, and elevation equipment.

3.1.4.4.1.1 Channel Selection. Control shall be provided to select one of the 200 MLS paired angle and DME/P channels from the local control. An interlock shall be provided to ensure that azimuth, elevation, and DME/P equipment are operating on the same channel.

3.1.4.4.1.2 Equipment Alignment and Antenna Scan Limit Adjustment. Local controls shall permit the ground equipment to be aligned for operation within the accuracy requirements. Alignment controls shall be operational only in the MAINTENANCE and STANDBY modes. Proportional guidance adjustments shall be possible only in the MAINTENANCE and STANDBY modes. Antenna scan limits shall be adjustable as specified in 3.1.4.1.12.1 and 3.1.4.1.12.2.

3.1.4.4.1.2.1 Azimuth Alignment Control. Controls shall be provided to align the electronic boresight to the 0° course line. The control of the bias correction shall be adjustable ±0.5°, in 0.01° increments. The bias correction adjustment shall be stored in non-volatile memory.

3.1.4.4.1.2.2 Elevation Aignment Control. Control shall be provided to align the scanning beam to the desired glidepath. The control of the bias correction shall be adjustable ±0.2°, in 0.01° increments. The bias correction adjustment shall be stored in non-volatile memory.

3.1.4.4.1.3 Modes. Controls shall be provided to permit selection of the equipment mode: OFF, STANDBY, SERVICE-DEMAND, ON, and MAINTENANCE.

3.1.4.4.1.4 Data Entry. A local control capability shall permit entry and update of monitor limits and basic and auxiliary data. Menus or other single-keystroke data entry techniques shall be used to minimize complexity. MMLS shall prevent invalid data entry. Invalid data shall be detected and shall cause the system to respond with error messages and prompts for providing correct input. The basic and auxiliary data shall be preset to the values listed in table I and stored in nonvolatile memory. Input of data in the field shall override the preset data and shall be retained when power is turned off.

3.1.4.4.1.5 PRESET Control. A PRESET control at the local control shall be provided to return data entries to the factory-preset values. This control shall be protected from inadvertent activation.

3.1.4.4.1.6 Landing Performance Selection. A control shall be provided to select Category I or Category II monitor limits and restart monitor limits.

3.1.4.4.2 Local Display. Displays shall be provided at the local control unit to facilitate equipment alignment and data entry. A capability to review the monitor limits and the contents of each data word shall be provided. Displays designed in accordance with MIL-STD-1472 shall be legible in bright sunlight and darkness and shall include a brightness control . The brightness control shall be adjustable from full brightness to full darkness. The local display shall identify, as a minimum, the following:

a. Mode. The equipment is in the ON, OFF, STANDBY, MAINTENANCE, or SERVICE-DEMAND mode.

Table I. Preset Data Information

Data Item	Value
Azimuth to MLS datum point distance	0 ft
MLS datum point to threshold distance	900 ft
Azimuth coverage limit (negative) degrees	-40
Azimuth coverage limit (positive) degrees	+40
Clearance signal type	Scanning beam
Azimuth status	Transmit 1
Elevation status Transmit 1	
DME status	Transmit 01
Minimum glide path	3°
Azimuth beamwidth	3.0°
Elevation beamwidth	2.0°
DME distance (to MLS datum point)	0 ft
DME offset	150 ft
Azimuth antenna offset	150 ft
MLS ground equipment identification	
Character 2	M
Character 3	L
Character 4	S

e. Field Sensor. The field sensor is turned on or disabled.

f. Monitor Alarms. Visual alarms indicate out of tolerance conditions.

g. DME/P Interrogations. DME/P interrogations are being received.

3.1.4.4.3 Remote Control. A capability shall be provided to select equipment modes other than MAINTENANCE or OFF from a remote position. Remote control interface shall be provided at both the azimuth and elevation equipment. Remote controls shall be capable of supporting positions 8000 ft from the equipment over field wire or by other means subject to Government approval. The remote control unit shall be capable of controlling at least two MMLSs. Only one MMLS connected to the remote control unit shall be able to radiate at any given time. When MAINTENANCE mode is selected at a local control unit, the remote control shall be disabled. The MMLS equipment shall be capable of operation without the remote control connected.

3.1.4.4.4 Remote Display. A remote display shall be provided with the remote control unit. The displays shall be in accordance with MIL-STD-1472. All displays shall be legible in bright sunlight and darkness and shall include a brightness control. The brightness control shall be adjustable from full brightness to full darkness. A capability to review the contents of each data word shall be provided. The remote display shall indicate the following as a minimum:

a. Modes. The equipment is in the ON, STANDBY, SERVICE-DEMAND, or MAINTENANCE mode.

b. Performance Limits. The system is operating within either Category I or Category II monitor limits.

c. Power. External power or the internal battery is being used. Low battery power is indicated.

d. Monitor Alarms. Aural and visual alarms indicate out of tolerance conditions and the failed station. It shall be possible to control the volume of the aural alarms.

e. DME/P Interrogations. DME/P interrogations are being received in the SERVICE-DEMAND mode and the angle guidance equipment is radiating.

3.1.5 System Functional Relationships. MMLS system functional relationships are shown in figure 4. Power is provided by either an external source or the MMLS batteries. Angle guidance and data are generated so that MLS avionics can determine position relative to a selected glide path. Simultaneously, the DME/P transponder receives interrogations from DME equipped aircraft and generates reply pulses for range processing. Monitors determine whether the angle guidance, data, or DME performance are within specified tolerance limits. The control and display functions support entry of data, alignment of equipment and the monitoring of equipment status.

3.1.6 Configuration Allocation.

3.1.6.1 Azimuth Antenna Assembly Hardware Configuration Item (HWCI). The azimuth antenna assembly 6531-350002 shall include the azimuth antenna, a field monitor and ancillary equipment needed to perform azimuth angle guidance functions conforming to the TRSB format as specified in 3.11.4.5 and 3.11.4.6 of ICAO SARPS Annex 10 and requirements specified herein. The azimuth Antenna Assembly HWCI together with its associated transport containers shall satisfy the functional and performance requirements identified in table II.

3.1.6.2 Elevation Antenna Assembly HWCI. The elevation antenna assembly 6531-350003 shall include the elevation antenna, a field monitor and ancillary equipment needed to perform elevation guidance functions conforming to the TRSB format as specified in 3.11.4.5 and 3.11.4.7 of ICAO SARPS Annex 10 and requirements specified herein. The elevation Antenna Assembly HWCI together with its associated transport containers shall satisfy the functional and performance requirements identified in table II.

3.1.6.3 Control and Display Assembly HWCI. The control and display assembly 6531-350004 shall include two control electronics units, a remote control and display unit and battery housings and batteries. The control and display assembly shall perform: sequencing, control, and formatting for the angle guidance and data transmission functions; monitoring functions; control and display functions, and mode selection functions. The control and display assembly HWCI together with its associated transport containers shall satisfy the functional and performance requirements identified in table II.

3.1.6.4 DME Assembly. The DME Assembly 6531-350005 shall include a DME/P electronics unit and the DME/P antenna needed to provide slant range distance in accordance with 3.5.4 of ICAO SARPS Annex 10 and requirements specified herein. The DME assembly HWCI together with its associated transport containers shall satisfy the functional and performance requirements identified in table II.

3.1.6.5 MMLS Control Software Computer Software Configuration Item (CSCI). The MMLS Control Software CSCI 6531-944001 shall provide hardware initialization, error logging, BIT, interface, control panel, transmitter data, squitter rate control, automatic delay stabilization, DME maximum transmission rate and monitor functions. The MMLS control software CSCI shall satisfy the functional and performance requirements identified in table II.

3.1.7 Interface Requirements.

3.1.7.1 External Interfaces.

3.1.7.1.1 External Systems Description. The MMLS shall interface with aircraft equipped with MLS avionics and DME, and with external power sources.

3.1.7.1.1.1 MLS Avionics. MLS avionics receive ground-generated sector and scanning beam signals associated with the azimuth and elevation functions, determine the identity of the angle function, and then decode the scanning beam angle information. The receiver subjects the received signals to acquisition criteria before they are accepted and continuous validation following acceptance to provide reliable, interference-free angle information. Angle information is derived by measuring the time difference between the successive passes of the highly directive, narrow, fan-shaped beams. The avionics also receive basic and auxiliary data that are needed to support all weather operations. Deviation information, warning indications, and channel selection are provided to the flight crew.

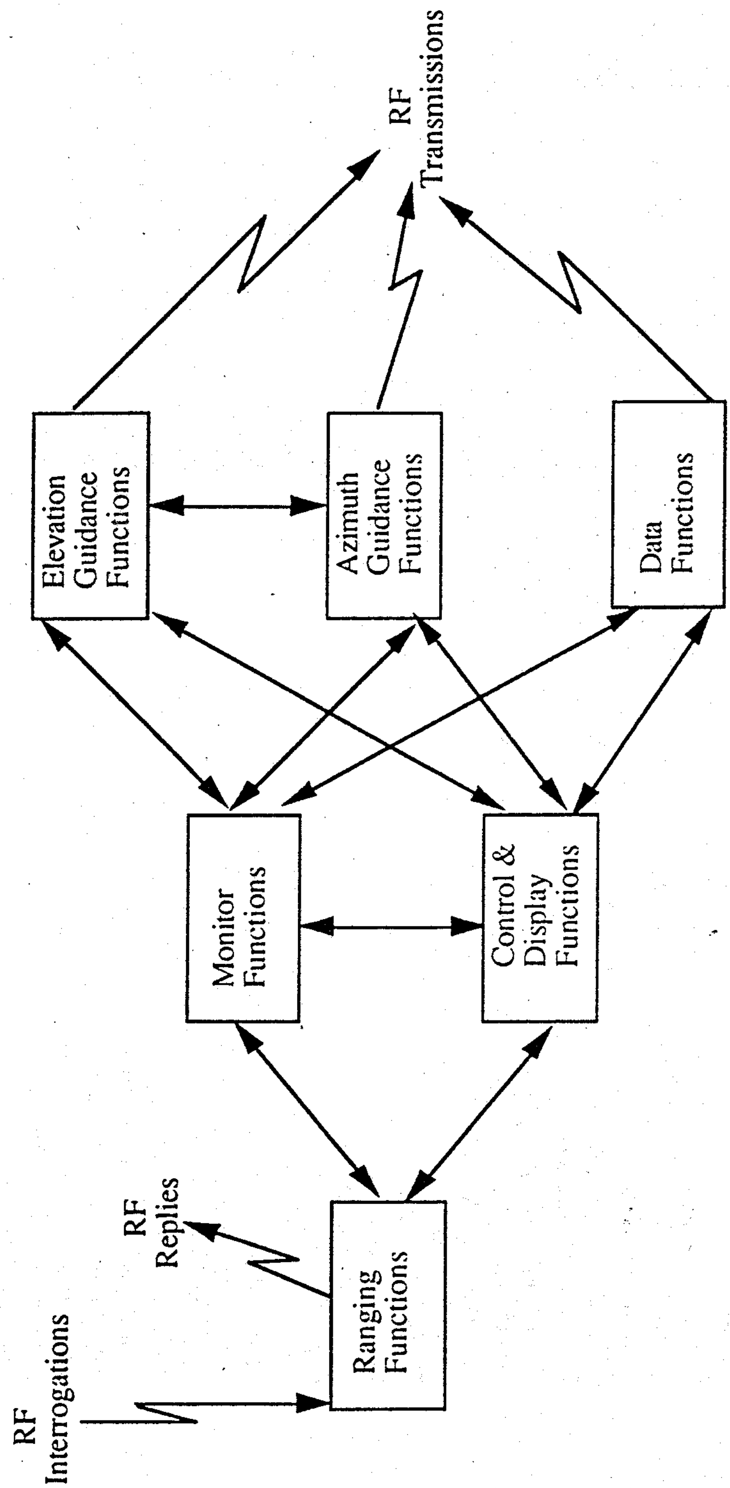

Figure 4. MMLS Functional Relationships

Table II. Configuration Item Requirements Cross Reference Matrix

Section 3 Paragraph	Requirements	System N/A	AZ ANT CI	EL ANT CI	CEU/RCDU CI	DME/P CI	MCS CSCI
3.1.3	Modes and states				X		
3.1.3.1.1	OFF mode				X		
3.1.3.1.2	STANDBY mode				X		X
3.1.3.1.3	MAINTENANCE mode				X		X
3.1.3.1.4	SERVICE-DEMAND mode				X		X
3.1.3.1.5	ON mode				X		X
3.1.3.2.1	Deployed state	X					
3.1.3.2.2	Stored state	X					
3.1.4	System functions				X		X
3.1.4.1.1	Channeling		X	X	X		X
3.1.4.1.1.1	Frequency tolerance				X		
3.1.4.1.1.2	RF signal spectrum				X		
3.1.4.1.2	Polarization		X	X			
3.1.4.1.3	Signal organization				X		X
3.1.4.1.3.1	Function rates				X		X
3.1.4.1.3.2	Function timing				X		
3.1.4.1.3.3	Function sequence				X		X
3.1.4.1.3.4	Synchronization				X		X
3.1.4.1.4	Preamble				X		X
3.1.4.1.4.1	Carrier acquisition				X		X
3.1.4.1.4.2	Modulation				X		
3.1.4.1.4.3	Receiver reference time code				X		X
3.1.4.1.4.4	Function identification				X		X
3.1.4.1.5	Angle guidance encoding				X		X
3.1.4.1.5.1	Angle guidance parameters				X		
3.1.4.1.5.2	Angle guidance parameter tolerances				X		
3.1.4.1.5.3	Scan transmission symmetry				X		
3.1.4.1.6.1	Scanning convention				X		
3.1.4.1.6.2	Sector signals				X		X
3.1.4.1.6.2.1	Morse Code equipment identification				X		X

Table II (Continued)

Section 3 Paragraph	Requirements	System N/A	AZ ANT CI	EL ANT CI	CEU/RCDU CI	DME/P CI	MCS CSCI
3.1.4.1.6.2.2	Airborne antenna selection signal				X		X
3.1.4.1.7.1	Scanning conventions				X		
3.1.4.1.7.2	Sector signals				X		X
3.1.4.1.8	Data functions				X		X
3.1.4.1.8.1	Basic data				X		
3.1.4.1.8.2	Auxiliary data				X		
3.1.4.1.9	System accuracy	X					
3.1.4.1.9.1.1	Mean course error	X					
3.1.4.1.9.1.2	AZ PFN	X					
3.1.4.1.9.1.3	AZ degradation allow	X					
3.1.4.1.9.2.1	Mean glidepath error	X					
3.1.4.1.9.2.2	EL PFN	X					
3.1.4.1.9.2.3	EL degradation allow	X					
3.1.4.1.10	Power density		X	X	X		
3.1.4.1.11	Residual radiation				X		
3.1.4.1.12	Coverage		X	X			X
3.1.4.1.12.1	AZ scan adjustment				X		X
3.1.4.1.12.2	EL scan adjustment				X		X
3.1.4.1.13	AZ scanning beam characteristics		X				
3.1.4.1.13.1	Beamwidth		X				
3.1.4.1.13.2	Scanning beam shape		X				
3.1.4.1.13.3	Dynamic sidelobes		X				
3.1.4.1.14	EL scanning beam characteristics			X			
3.1.4.1.14.1	Beamwidth			X			
3.1.4.1.14.2	Scanning beam shape			X			
3.1.4.1.14.3	Dynamic sidelobes			X			
3.1.4.2.1.1	DME/P Coverage		X				
3.1.4.2.1.2	Channeling				X	X	X
3.1.4.2.1.3	Capacity					X	X

Table II (Continued)

Section 3 Paragraph	Requirements	System N/A	AZ ANT CI	EL ANT CI	CEU/RCDU CI	DME/P CI	MCS CSCI
3.1.4.2.1.4	DME/P transponder identification					X	X
	Reply pulses					X	
	Identification code characteristics					X	
	Identification implementation					X	
3.1.4.2.2.1	Frequency of operation					X	
3.1.4.2.2.2	Frequency stability					X	
3.1.4.2.2.3	Pulse shape and spectrum					X	
3.1.4.2.2.4	Pulse spacing					X	X
3.1.4.2.2.5	Power density					X	X
	Minimum transmission rate					X	
3.1.4.2.2.6	Spurious radiation					X	X
	Out-of-band spurious radiation					X	
3.1.4.2.2.7	Squitter					X	X
3.1.4.2.2.8	Priority of transmission					X	X
3.1.4.2.3.1	Frequency of operation					X	
3.1.4.2.3.2	Frequency stability					X	
3.1.4.2.3.3	Sensitivity					X	
	Minimum interrogation power density					X	
	Reply efficiencies					X	
	Dynamic range					X	
	Pulse pair spacing variations					X	
3.1.4.2.3.4	Sensitivity reduction					X	
3.1.4.2.3.5	Bandwidth					X	
	Minimum bandwidth					X	
	Out-of-band signals					X	
3.1.4.2.3.6	Recovery time					X	
3.1.4.2.3.7	Spurious radiations					X	
3.1.4.2.3.8	Echo suppression					X	X
3.1.4.2.3.9	CW interference					X	

Table II (Continued)

Section 3 Paragraph	Requirements	System N/A	AZ ANT CI	EL ANT CI	CEU/RCDU CI	DME/P CI	MCS CSCI
3.1.4.2.4	Decoding					X	X
	Transponder triggering					X	
	Decoder rejection					X	
3.1.4.2.5	Time delay					X	X
3.1.4.2.6	Accuracy					X	
3.1.4.2.7	Efficiency					X	
	Reply efficiency					X	
	Receiver dead time					X	
3.1.4.3	Monitor function	X					X
3.1.4.3.1	Integrity requirement		X	X	X	X	X
3.1.4.3.1.1	End-to-end integrity check capability				X		X
3.1.4.3.2.1	Angle and data monitor parameters				X		X
3.1.4.3.2.2	Angle and data monitor characteristics				X		X
3.1.4.3.2.3	Responses to angle and data monitor alarms				X		X
3.1.4.3.3	DME/P monitoring					X	X
3.1.4.3.3.1	Responses to DME/P monitor alarms				X	X	X
3.1.4.4	Control and display functions				X		X
3.1.4.4.1	Local control				X		X
3.1.4.4.1.1	Channel selection				X		X
3.1.4.4.1.2	Equipment alignment and antenna scan limit adjustment				X		X
3.1.4.4.1.3	Modes				X		X
3.1.4.4.1.4	Data entry				X		X
3.1.4.4.1.5	PRESET control				X		X
3.1.4.4.1.6	Landing performance selection				X		X
3.1.4.4.2	Local display				X		X
3.1.4.4.3	Remote control				X		X

Table II (Continued)

Section 3 Paragraph	Requirements	System N/A	AZ ANT CI	EL ANT CI	CEU/RCDU CI	DME/P CI	MCS CSCI
3.1.4.4.4	Remote display				X		
3.1.7.1.1.3	Power				X		
3.1.7.1.3	Hardware-to-hardware external interfaces				X		
3.1.7.1.4.1	MLS avionics interface	X					
3.1.7.1.4.2	DME interface	X					
3.2.1.1	Weight		X	X	X	X	
3.2.1.2	Dimensions		X	X	X	X	
3.2.1.3	Transportability		X	X	X	X	
3.2.1.3.1.1	Air transport: fixed wing		X	X	X	X	
3.2.1.3.1.2	Air transport: rotary wing		X	X	X	X	
3.2.1.3.2.1	Truck transport		X	X	X	X	
3.2.1.3.2.2	Trailer transport		X	X	X	X	
3.2.1.3.2.3	Rail transport		X	X	X	X	
3.2.1.3.3	Ship transport		X	X	X	X	
3.2.1.3.4	Man transport		X	X	X	X	
3.2.1.3.5	Modular packaging		X	X	X	X	
3.2.1.4	Durability		X	X	X	X	
3.2.1.5	Stability		X	X	X	X	
3.2.2	Environmental conditions		X	X	X	X	
3.2.2.1.1	Temperature		X	X	X	X	
3.2.2.1.2	Relative humidity		X	X	X	X	
3.2.2.1.3	Altitude		X	X	X	X	
3.2.2.1.4	Sand and dust		X	X	X	X	
3.2.2.1.5	Salt fog		X	X	X	X	
3.2.2.1.6	Fungus		X	X	X	X	
3.2.2.1.7	Rain		X	X	X	X	
3.2.2.1.8	Sunshine		X	X	X	X	
3.2.2.1.9	Wind		X	X	X	X	
3.2.2.1.10	Ice and hail		X	X	X	X	
	Deicing		X	X	X	X	
	Hail		X	X	X	X	

Table II (Continued)

Section 3 Paragraph	Requirements	System N/A	AZ ANT CI	EL ANT CI	CEU/RCDU CI	DME/P CI	MCS CSCI
3.2.2.1.11	Snow		X	X	X	X	
3.2.2.1.12	Lightning		X	X	X	X	
3.2.2.2.1	Shock and vibrations		X	X	X	X	
3.2.2.2.2	Storage		X	X	X	X	
	Stackability		X	X	X	X	
-	Accessibility (batteries)				X		
3.2.4.1	Design and construction		X	X	X	X	
3.2.4.2	Obstruction lights		X	X			
3.2.4.3	Internal power				X		
	Charging				X		
	Standby battery switchover				X		
	Battery type				X		
	Low temperature operation				X		
3.2.4.4	Fastener hardware		X	X	X	X	
3.2.4.5	Cables and connectors		X	X	X	X	
3.2.4.6	Encapsulation and embedment material		X	X	X	X	
3.2.4.7	Finish		X	X	X	X	
3.2.4.8	Chemical decontamination		X	X	X	X	
3.2.4.9.1	Derated application of parts		X	X	X	X	
3.2.4.9.2	Parts selection and screening		X	X	X	X	
3.2.4.10	Environmental stress screening		X	X	X	X	
3.2.5	Electromagnetic radiation		X	X	X	X	
3.2.6	Workmanship		X	X	X	X	
3.2.7	Interchangeability		X	X	X	X	
3.2.8	Safety		X	X	X	X	
3.2.8.1	Safety criteria		X	X	X	X	
	Applied		X	X	X	X	
	Hazards		X	X	X	X	
3.2.8.2	Grounding, bonding, and shielding		X	X	X	X	
3.2.8.3	Electrical overload protection		X	X	X	X	

Table II (Continued)

Section 3 Paragraph	Requirements	System N/A	AZ ANT CI	EL ANT CI	CEU/RCDU CI	DME/P CI	MCS CSCI
3.2.8.4	Corona and electrical breakdown prevention		X	X	X	X	
3.2.9	Human performance/human engineering		X	X	X	X	
3.2.10.1	Set up and teardown	X					
3.2.10.1.1	Collocated group	X					
3.2.10.1.2.1	Split-site setup (Cat I)	X					
3.2.10.1.2.2	Split-site setup (Cat II)	X					
3.2.10.2.1	Collocated siting	X					
3.2.10.2.2.1	Split-site siting (Cat I)	X					
3.2.10.2.2.2	Split-site siting (Cat II)	X					
3.2.10.2.2.2.1	Category II design	X					
3.2.10.2.3	Non-degradation conditions	X					
3.2.12	Nameplates and product marking		X	X	X	X	
3.2.12.1	Nameplates		X	X	X	X	
3.2.12.2	Cable identification		X	X	X	X	
3.2.12.3	Crystal identification		X	X	X	X	
3.3.1.1	Computer hardware requirements				X	X	
3.3.1.1.1	Memory				X	X	X
3.3.1.1.2	Processing speed				X	X	X
3.3.1.1.3	Port requirements				X	X	X
3.3.1.2	Programming requirements					X	X
3.3.1.2.1	Programming languages					X	X
3.3.1.2.2	Compilers and assemblers					X	X
3.3.1.2.3	Operating system					X	X
3.3.1.2.3.1	Operating system augmentations					X	X
3.3.1.3	Design and coding constraints					X	X
3.3.1.3.1	Design requirements					X	X
3.3.1.3.2	Coding requirements					X	X
3.4.1.1	MTBCF		X	X	X	X	X
3.4.1.2	MTBCMA		X	X	X	X	X
3.4.1.3	Independence of failures		X	X	X	X	

Table II (Continued)

Section 3 Paragraph	Requirements	System N/A	AZ ANT CI	EL ANT CI	CEU/RCDU CI	DME/P CI	MCS CSCI
3.4.1.4	Reliability modeling and allocations		X	X	X	X	
3.4.1.5	Reliability predictions		X	X	X	X	
3.4.2.1.1.1	FFD		X	X	X	X	
3.4.2.1.1.2	MTBFA		X	X	X	X	
3.4.2.1.2.1	FFI: Organizational-level		X	X	X	X	
3.4.2.1.2.2	MTTR: Organizational-level	X					
3.4.2.1.4.1	FFI: Depot-level		X	X	X	X	
3.4.2.1.5	Preventive Maintenance		X	X	X	X	
	60 minute requirement		X	X	X	X	
	90 day requirement		X	X	X	X	
	10 minute restoral requirement		X	X	X	X	
3.4.4	Portability		X	X	X	X	
3.5.1.1.1	Common support equipment		X	X	X	X	
3.5.1.2.1	Organizational-level Maintenance		X	X	X	X	
3.5.1.2.2	Depot-level Maintenance		X	X	X	X	
3.5.3	Supply		X	X	X	X	

3.1.7.1.1.2 DME. DME is an air-derived system in which the airborne equipment interrogates a ground transponder (MMLS) with paired pulses at a specific spacing. The ground transponder receives the interrogation and, after a predetermined time delay, transmits a reply on a different carrier frequency. The airborne equipment receives this reply and measures the time difference between its original interrogation and the ground reply. Based upon this time difference, the airborne equipment computes and displays the range of the ground transponder.

3.1.7.1.1.3 Power. The MMLS shall be capable of operating from external AC and DC power sources including batteries and generators.

3.1.7.1.2 External Interface Identification. The external interfaces of MMLS are shown in figure 5.

3.1.7.1.3 Hardware-to-Hardware External Interfaces. External AC power sources shall be 47 to 63 Hz, and either 115 ±20 percent volts or 230 ±20 percent volts, single-phase power as specified in MIL-E-4158 and MIL-STD-633. External DC power sources shall be 24 ±4 volt batteries and 28-volt DC generators including mobile electric power (MEP) 024, 025, 026 or equivalent.

Only a single external power source shall be necessary in the MMLS collocated configuration. In the split-site configuration, the azimuth and elevation equipment locations shall be capable of interfacing with separate external power sources. The remote control and display unit shall also be capable of operating from external power.

Three types of power cables shall be provided to connect the MMLS equipment to any of the three types of external power sources (230 VAC, 115 VAC, and 24-28 VDC). Each cable shall be terminated at one end with the appropriate MMLS compatible connector and the other end shall be undermined. The 230 VAC and the 24-28 VDC cables shall be at least 10 ft long and the 115 VAC shall be at least 50 ft long. One of each cable type shall be provided for each of the azimuth equipment, elevation equipment, and remote control and display unit.

3.1.7.1.4 Software-to-Software External Interfaces.

3.1.7.1.4.1 MLS Avionics Interface. The interface with the avionics equipment is via RF transmission of angle guidance and data. The MMLS shall be interoperable with MLS receivers as defined by RTCA DO-177 and S.N. 404L 50464-S-109.

3.1.7.1.4.2 DME Interface. The interface with the DME aboard the aircraft is via RF transmission. The MMLS shall be interoperable with DME interrogators as defined by RTCA DO-189.

3.1.7.2 Internal Interfaces. Internal interface requirements shall be determined by the contractor in accordance with Appendix I of MIL-STD-490 subject to Government approval.

3.1.8 Government-Furnished Property List. This paragraph is not applicable to this specification.

3.2 System Characteristics.

3.2.1 Physical Requirements.

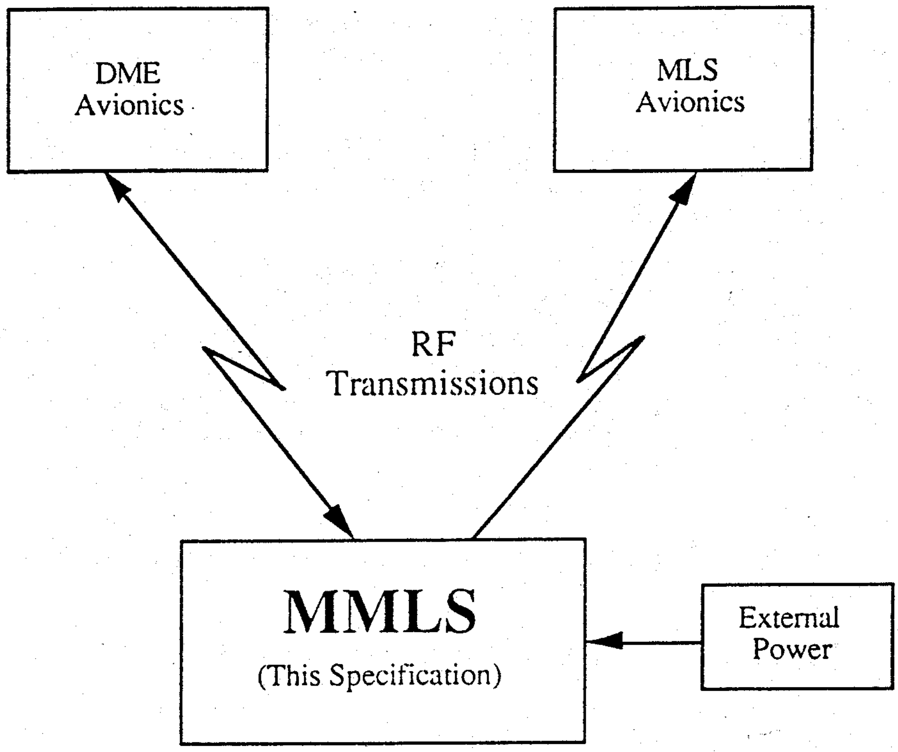

Figure 5. MMLS External Interface Diagram

3.2.1.1 Weight. The MMLS when packaged for transport shall weigh less than 1500 lbs for the split-site configuration, and less than 1200 lbs in the collocated configuration. All equipment required to install, align, calibrate, and verify system operation shall be considered a part of the system and included in the weight. The weight of the remote control unit, and 1/4 mile of WD-l/TT field wire and CE-ll spool and handle assembly for control unit remoting shall be included for the split-site configuration. The weight of the uninterruptible power system (UPS) batteries, their transit cases, and the synchronization line between the azimuth and elevation equipment shall not be included.

3.2.1.1.1 Equipment Weight. The MMLS when removed from its transit cases shall weigh less than 850 lbs in the split-site configuration, and less than 650 lbs in the collocated configuration.

3.2.1.2 Dimensions. The dimensions of the MMLS shall be such that it shall be possible to transport MMLS equipment by all of the methods in 3.2.1.3. Transit cases shall be provided for each transport module.

3.2.1.3 Transportability. The MMLS shall be capable of being broken down into a maximum of 14 stackable transport modules to facilitate transport by a variety of modes and vehicles. The transit cases shall meet the requirements of MIL-C-4150 as tailored in Appendix II. The design shall permit rapid on/off loading without the need for items not normally employed with transport vehicles or provided with MMLS. The design of the MMLS transport modules shall provide means for securing the transport modules to the vehicle.

3.2.1.3.1 Air Transport.

3.2.1.3.1.1 Aircraft: Fixed Wing. The MMLS shall be transportable in C-17, C-130, C-141, and C-5 aircraft.

3.2.1.3.1.2 Aircraft: Rotary Wing. The MMLS shall be transportable in a single helicopter sling load.

3.2.1.3.2 Ground Transport.

3.2.1.3.2.1 Truck Transport. The MMLS shall be transportable in a single 1-1/4-ton four-wheel drive commercial utility cargo vehicle (CUCV), M880 land vehicle, or high mobility multipurpose wheeled vehicle (HMMWV).

3.2.1.3.2.2 Trailer Transport. The MMLS shall be transportable in both one M-116A2, 3/4 ton trailer as specified in MIL-C-45150J and one 1/2 to 1-1/2 ton trailer as specified in MIL-T-10579.

3.2.1.3.2.3 Rail Transport. The MMLS shall be transportable by rail either as palletized or trailer-mounted cargo.

3.2.1.3.3 Ship Transport. The MMLS shall be transportable as containerized cargo for sea transport.

3.2.1.3.4 Man Transport. The design of MMLS transport modules and transit cases shall provide for ease of carrying in accordance with MIL-STD-1472. Each of the 14 stackable transport modules shall weigh less than 130 lbs with the exception of a maximum of 5 which shall either 1) weigh less than 195 lbs or 2) break into two submodules (man transportable modules), each weighing less than 195 lbs. Transport modules weighing 130 lbs or less shall be transportable by two people. Transport modules weighing more than 130 lbs, but less than 195 lbs, shall be transportable by three people. The maximum number of man-transport modules shall be 16.

3.2.1.3.5 Modular Packaging. The modular design shall allow the system to be deployed in either a split-site or collocated configuration without reconfiguring transport modules.

3.2.1.4 Durability. The MMLS shall be designed to withstand at least 500 setups and teardowns over its lifetime without degradation in performance except for that allowed by the reliability requirements of 3.4.1.

3.2.1.5 Stability. The MMLS equipment shall remain within performance limits without realignment for at least ten days when set up under the specified siting and operational environmental conditions.

3.2.2 Environmental Conditions. The MMLS shall be capable of withstanding any individual or combination of environmental conditions specified herein without mechanical or electrical damage or operational degradation. Unless otherwise specified, these requirements apply to MMLS in all of its modes and states.

3.2.2.1 Natural Environment.

3.2.2.1.1 Temperature.

3.2.2.1.1.1 Storage, Transport, and Nonoperating. From -57° C to +68° C.

3.2.2.1.1.2 Operating. From -51° C to +49° C with 360 BTU/hr/ft solar radiation.

3.2.2.1.2 Relative Humidity.

3.2.2.1.2.1 Minimum. 20 percent from the minimum operating temperature to 16° C. Above 16° C, the relative humidity shall be based on a dew point of -7° C.

3.2.2.1.2.2 Maximum. 100 percent including condensation from the minimum operating temperature to 27° C. Above 27° C, the relative humidity shall be based on a dew point of 27° C.

3.2.2.1.3 Altitude.

3.2.2.1.3.1 Nonoperating. 0 to 40,000 ft with a maximum altitude change of up to 2,000 ft per minute.

3.2.2.1.3.2 Operating Altitude Range. 0 to 10,000 ft.

3.2.2.1.4 Sand and Dust. The equipment shall operate without degradation or failure when exposed to sand and dust as specified in MIL-STD-210 for operation in close proximity to aircraft.

3.2.2.1.5 Salt Fog. The equipment shall operate without degradation or failure when exposed to a salt fog atmosphere with a salt concentration of at least 5 percent.

3.2.2.1.6 Fungus. The equipment shall withstand exposure to the species of fungi specified in MIL-STD-810 for a minimum period of 28 days.

3.2.2.1.7 Rain. For waterproofing, the MMLS shall withstand, without leakage, exposure to rain rates of 4 in/hr for 2 hr with wind levels specified herein. MMLS performance requirements shall be met in rain rates of 2 in/hr over a 5-nmi cell and 1 in/hr over the remainder of the coverage area.

3.2.2.1.8 Sunshine. The external surfaces and materials of the equipment shall withstand prolonged exposure to sunshine as defined in MIL-STD-810, method 505.2, Procedure II. Surface colors shall not fade, paints and coatings shall not crack, nor shall such items as gaskets or any other materials show signs of deterioration.

3.2.2.1.9 Wind. In the ON mode, the MMLS shall remain within monitor limits in steady winds up to 50 kt and in gusts or jet blasts of up to 75 kt from any direction. The MMLS shall remain in position and sustain no damage in winds up to 100 kt from any direction.

3.2.2.1.10 Ice and Hail. The MMLS shall not sustain mechanical damage when exposed to 1/2-inch glaze ice on the external surfaces. Angle guidance antenna radomes shall be provided with a deicing capability other than physical scraping. An indicator of deicing capability operation shall be provided. Additionally, all other radomes shall prevent the formation of ice that will degrade the operational performance while operating on external power. The MMLS shall be capable of withstanding hailstones up to 0.5 inch diameter.

3.2.2.1.11 Snow. The MMLS shall withstand the snow load specified in MIL-STD-210 for temporary equipment.

3.2.2.1.12 Lightning. Transient protection for lightning shall protect against pulses having the characteristics defined in MIL-E-4158. Self supporting lightning rods, providing a cone of protection sufficient to encompass the MMLS equipment, shall be provided.

3.2.2.2 Induced Environment.

3.2.2.2.1 Shock and Vibrations. The MMLS shall withstand the vibrations and shocks encountered while being transported by any of the specified methods and shall be capable of passing the shock and vibration tests specified in 4.2.4.11. In addition, the MMLS shall be protected from shocks induced by being dropped during handling, setup, and teardown.

3.2.2.2.2 Storage. The MMLS shall not incur damage when stored for a period of up to 2 years. The individual MMLS transport modules shall be stackable for storage and transport. Batteries shall be easily accessible so that they may be removed for separate storage or for testing, replacement, and recharging.

3.2.3 Nuclear Control Requirements. This paragraph is not applicable to this specification.

3.2.4 Materials, Processes, and Parts.

3.2.4.1 Design and Construction. General design and construction of MMLS shall be in accordance with MIL-E-4158 and MIL-STD-454.

3.2.4.2 Obstruction Lights. MMLS shall be provided with detachable obstruction lights. Structure and wiring for obstruction lights shall be as specified in AFM 88-14.

3.2.4.3 Internal Power. MMLS shall be provided with an uninterruptible power system (UPS) with batteries capable of operating the MMLS, including the remote control unit, for the worst case of 2 hours in the ON mode or 8 hours at a duty cycle of 20 percent in the SERVICE-DEMAND mode. Batteries shall be chargeable in any MMLS operating mode. Protective circuitry shall be provided to prevent battery damage from excessive charge or deep discharge. If external power is interrupted, batteries shall automatically assume the load of the external power source with no loss of functions other than deicing and use of obstruction lights. Batteries shall conform to MIL-B-82117D or Requirement 27 of MIL-STD-454. Only one type of battery shall be provided with the MMLS except for the battery required for the remote control unit. When on external power for a minimum of two hours at the minimum operating temperature, the batteries shall be maintained at a temperature that would permit a minimum of two hours operation after external power is interrupted.

3.2.4.4 Fastener Hardware. Equipment to be assembled or disassembled in the field shall be secured with corrosion-resistant captive hardware, and fabricated in accordance with Requirement 12 of MIL-STD-454 to suit the specified environmental conditions.

3.2.4.5 Cables and Connectors. Connectors shall be in accordance with Requirement 10 of MIL-STD-454, except that only MIL-C-38999 and MIL-C-83723 covering circular connectors, MIL-C-55302 covering printed circuit board connectors, and MIL-C-83733 covering rectangular rack and panel connectors are permitted. Electrical connectors requiring potting compound material shall not be used. Connectors shall be keyed and marked to prevent incorrect assembly. Cables and wire shall be in accordance with MIL-C-13294 and Requirements 20, 65, 66, and 71 of MIL-STD-454. The azimuth and elevation digital cables shall be interchangeable. The RF cables shall be interchangeable.

3.2.4.6 Encapsulation and Embedment Material. Materials used for encapsulation and embedment shall be selected for the operational environment conditions in accordance with Requirement 47 of MIL-STD-454. Only those materials that meet or exceed the requirements of MIL-S-8516, MIL-S-23586, and MIL-I-81550 shall be used.

3.2.4.7 Finish. Exterior surfaces, including exterior surfaces of transit cases, shall comply with the requirements of MIL-C-46168, and shall be green 383 as specified in MIL-C-46168 and match chip number 34094 as specified in FED-STD-595. All other surfaces shall comply with MIL-F-14072. All exterior surfaces shall be primed in accordance with DOD-P-15328D and/or MIL-P-85582 as appropriate. If the color of a surface is contained in the surface material, the finish shall approximate the finish of the MMLS painted surfaces.

3.2.4.8 Chemical Decontamination. The MMLS external surfaces shall be designed and constructed to facilitate chemical decontamination. The MMLS external surfaces shall also be resistant to damage from decontamination agents specified in ARCSL-CR-81053, excluding DS2 and STB. The design shall provide no areas where gaseous and/or liquid agents and decontaminating solutions can collect.

3.2.4.9 Parts.

3.2.4.9.1 Derated Application of Parts. All parts shall comply with a Government-approved contractor derating standard or with ESD-TR-85-148, derating level III. The contractor shall supply and validate all derating standards utilized by the manufacturers of any commercial off-the-shelf equipment/parts used in the design, defining each derating level subject to the approval of the Government.

3.2.4.9.2 Parts Selection and Screening. Parts used in newly designed or modified items shall be selected from the Government Furnished Baseline (GFB) Electrical/Electronic Parts, and the Government Furnished Baseline Mechanical Parts. Parts not covered by these GFBs will be selected by the contractor and approved by the Government using DI-MISC-80071/T. Defective parts identified in the Government/Industry Data Exchange Program (GIDEP) Failure Experience Data Interchange (FEDI) shall not be used. Approved nonstandard parts shall be adequately screened to ensure quality and reliability. Microcircuits shall be screened by the manufacturer in accordance with MIL-STD-883 Class B Method 5004 or Method 5008. The contractor shall have the option to rescreen selected parts to further ensure high quality and reliability. Figure 6 summarizes the parts control procedures.

3.2.4.10 Environmental Stress Screening (ESS). MMLS shall be ESS in accordance with a Government-approved contractor ESS standard or the method prescribed in figure 7. Further, the requirements shall be incorporated in 3.3.2, entitled "Standards of Manufacture," in the configuration item product fabrication specifications to ensure that effective ESS is performed on production equipment. For commercial off-the-shelf equipment, the conditions under which ESS was performed by the manufacturer, with supporting data or field data of acceptable performance, shall be submitted to the Government for approval.

3.2.5 Electromagnetic Radiation. The MMLS equipment shall be designed to operate within the electromagnetic interference (EMI) and susceptibility limits specified for airport environments in tables 1-1 and
1-lA of FAA-E-2721/11.

3.2.6 Workmanship. Workmanship shall conform to MIL-STD-454, Requirement 9.

3.2.7 Interchangeability. Interchangeability of like assemblies, subassemblies, modules, and parts shall conform to MIL-STD-454, Requirement 7.

3.2.8 Safety. The system shall be designed and constructed as specified in MIL-STD-454 and MIL-STD-1472 to prevent injury to personnel or equipment during installation, operation, and maintenance. For personnel safety, the contractor shall conform to Requirement 1 of MIL-STD-454.

3.2.8.1 Safety Criteria. Safety criteria shall be applied during equipment hardware design, selection, and construction to eliminate hazards that could cause injury. Hazards, such as sharp corners, projections, or moving parts that could cause injury directly or indirectly by catching on to clothing shall be eliminated, minimized by design effort, or covered with protective shields or guards.

3.2.8.2 Grounding, Bonding, and Shielding. All grounding, bonding, and shielding shall conform to MIL-STD-454 Requirements 1 and 74. A grounding rod and associated ground cable to provide a suitable ground for each antenna site from potential high voltage surges appearing on the synchronization wire shall be provided.

3.2.8.3 Electrical Overload Protection. Electrical overload protection shall conform to Requirements 8 and 37 of MIL-STD-454 for circuit breakers.

3.2.8.4 Corona and Electrical Breakdown Prevention. Corona and electrical breakdown prevention shall conform to Requirement 45 of MIL-STD-454 and as specified herein.

3.2.8.5 Switch Covers. All exposed switches shall be protected from physical damage with switch guards.

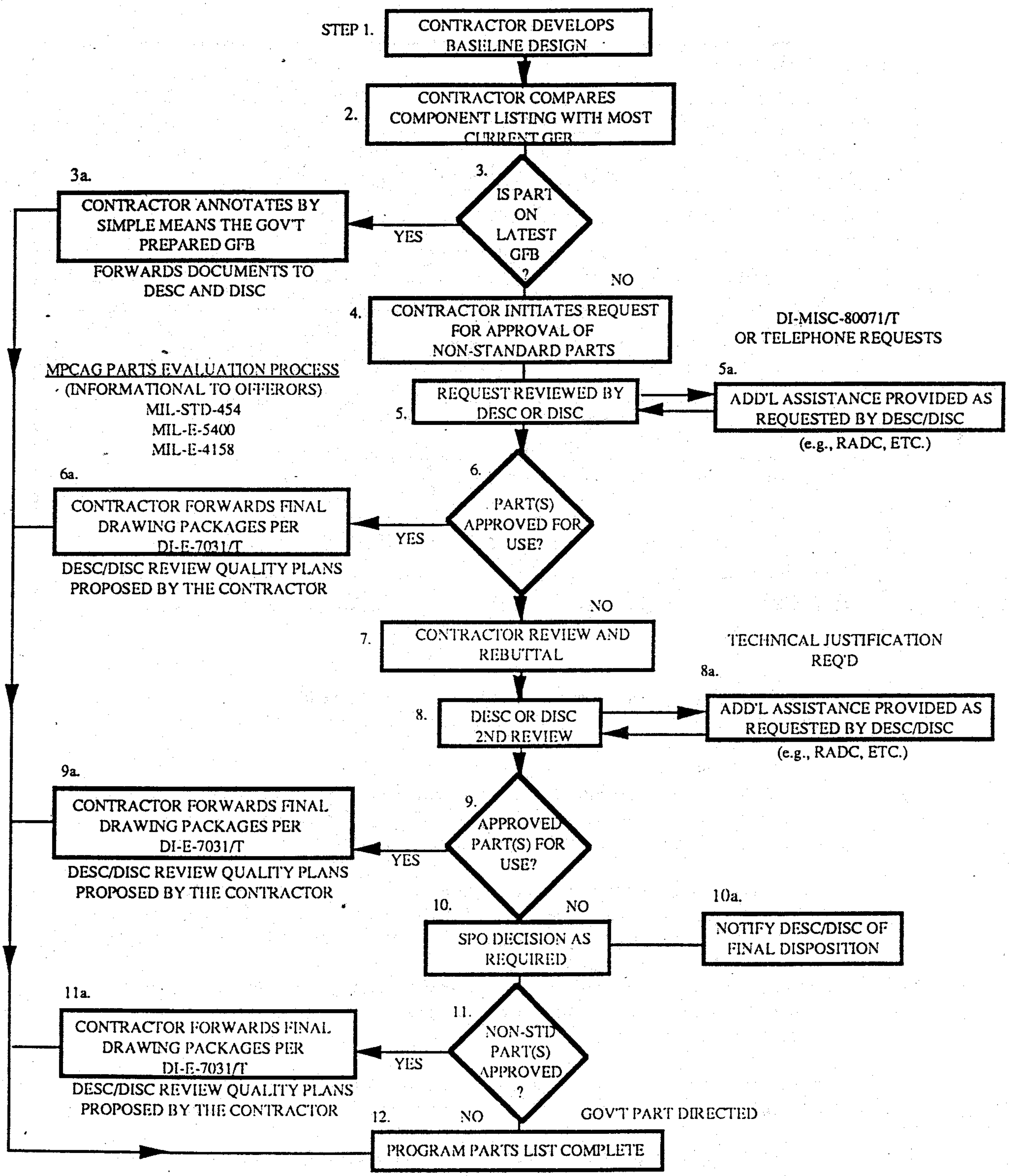

Figure 6. Parts Control Procedure

Temperature Cycling (See Note 6)	PC Board	Equipment, Box, or Drawer	System or Prime Item
Temperature Dwell Range	-54 To +85°C	-54 To +71°C	-54 To +71°C
Temperature Rate of Change (See Note 4)	30 Deg. C Min. (Chamber Air Temp)	10 Deg. C Min. (Chamber Air Temp)	10 Deg. C Min. (Chamber Air Temp)
Temperature Dwell Duration	See Note 1	See Note 1	See Note 1
Temperature Cycles	25	10	5
Failure Free Requirements	Last Two Cycles	Last Two Cycles	Last Two Cycles
Equipment Operation	See Note 2	See Note 2	See Note 2
Equipment Monitoring	See Note 3	See Note 3	See Note 3
Vibration (See Note 5)			
Type	Random	Random	Not Applicable
Power Spectral Density	0.045^2 G/Hz (Average) (20-1000 Hz)	0.045^2 G/Hz (Average) (20-1000 Hz)	
Axes Stimulated Serially or in Combination	2 or 3 Axes	2 or 3 Axes	
Duration Of Vibration	Ten Minutes/Axis	Ten Minutes/Axis	
Equipment Operation	See Note 2	See Note 2	
Equipment Monitoring	See Note 3	See Note 3	

Notes

(1) The next temperature ramp can commence as soon as the temperature has stabilized (i.e., when he temperature of the part of the test item considered to have the longest thermal lag is changing no more than 2°C per hour).

(2) Screened assemblies shall be operating during the temperature rise and vibration and off during the temperature drop. Operating equipment shall be at maximum power loading. Power shall be turned on and off a minimum of three times at the temperature extremes of each cycle.

(3) Instantaneous go-no go performance monitoring during the stress is essential to identify intermittent failures. If such monitoring can not be performed for one level of assembly, ESS will be performed on the next higher level of assembly, but using the ESS specifications of the lower assembly level.

(4) Use of temperature chambers that will provide the temperature rate of change is desired. However, rapid transfers of the equipment between one chamber at maximum temperature and another chamber at minimum temperature is acceptable.

(5) Simultaneous vibration and temperature stress screening is desired but not required. When temperature and vibration are applied separately, it is recommended that vibration occur first.

(6) At least five of the required temperature cycles will be performed after the random vibration portion of this last screen. The last two temperature cycles will be failure free.

Figure 7. ESS Requirements

3.2.9 Human Performance/Human Engineering. Human performance/ engineering shall be in accordance with MIL-STD-1472 and MIL-STD-454, Requirements 36 and 62. All requirements for setup, alignment, operation, and on-site maintenance of equipment exposed to the external environment shall be met while operators and maintenance personnel wear restrictive clothing, including extreme cold weather mittens as specified in MIL-M-87033 and chemical-resistant clothing as specified in ARCSL-CR-81053.

3.2.10 Deployment Requirements. MMLS will operate anywhere in the world in all weather conditions, including tropical, desert, or arctic environments.

3.2.10.1 Setup and Teardown. MMLS setup time shall begin after the equipment has been placed at its erection site. The setup time shall include unpacking the equipment, erecting antennas, interconnecting the equipment, connecting to external power, turning it on, anchoring, installing monitor equipment, connecting the remote control, and performing the alignment necessary to prepare the equipment for flight inspection. Hand tools to support anchoring shall be provided with the system and shall be chosen by the contractor subject to Government approval. Time necessary to "run cable" between split-site configuration equipment sites shall not be considered part of setup time. Teardown time shall include time to turn off the equipment and prepare the equipment for transportation to another location. Specific setup times and siting requirements for different configurations and categories of performance shall be as specified below.

3.2.10.1.1 Collocated Configuration. MMLS in a collocated configuration shall be capable of Category I performance following a setup procedure by no more than three persons that takes less than 75 minutes. Teardown time shall not exceed 75 minutes by no more than three persons. Realignment of equipment shall take less than 10 minutes.

3.2.10.1.2 Split-Site Configuration.

3.2.1O.1.2.1 Category I. MMLS in a split-site configuration shall be capable of Category I performance following a setup procedure by no more than three persons that takes less than 75 minutes to erect the approach azimuth and DME/P equipment at its location and less than 75 minutes to erect the approach elevation equipment at its location. Realignment of equipment at each location shall take no longer than 10 minutes.

3.2.10.1.2.2 Category II. MMLS shall be set up within Category II monitor parameter limits following a setup procedure that takes no longer than 2.5 hours. Category II performance shall be provided following calibration of the MMLS during a flight inspection procedure.

3.2.10.2 Siting. The MMLS shall be provided with auger type ground anchors, anchor plates, and associated stakes.

3.2.10.2.1 Collocated Configuration Siting. MMLS in a collocated configuration shall provide Category I performance with the MMLS equipment placed on surfaces specified in table I of DM 7.2, on bedrock and/or on concrete surfaces. The equipment shall be sited within the constraints shown in figure 8.

3.2.10.2.2 Split-Site Configuration Siting.